DOCUMENT RESUME

ED 224 149 EA 015 238

AUTHOR Tsang, Mun C.; Levin, Henry M.
TITLE The Impact of Intergovernmental Grants on Educational Spending.
INSTITUTION Stanford Univ., Calif. Inst. for Research on Educational Finance and Governance.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
REPORT NO IFG-PR-82-A14
PUB DATE Jul 82
GRANT OB-NIE-G-80-0111
NOTE 80p.
AVAILABLE FROM Publications, Institute for Research on Educational Finance and Governance, School of Education, CERAS Building, Stanford University, Stanford, CA 94305 ($1.00).
PUB TYPE Information Analyses (070) -- Viewpoints (120)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Block Grants; Categorical Aid; Elementary Secondary Education; *Federal Aid; Federal Government; *Federal State Relationship; *Government School Relationship; *Grants; Local Government; Models; Research Methodology; Revenue Sharing; *School District Spending; *State Aid; State Government
IDENTIFIERS *Intergovernmental Relations

ABSTRACT

Empirical literature on the effects of intergovernmental grants on educational spending is reviewed in this document, which examines 40 published works covering the last two decades. Intergovernmental grants include both state grants to local governments and federal grants to state and local governments. The review's first section summarizes general observations on the studies, noting that the studies use either time-series or cross-sectional analysis, that their statistical techniques and models of governments' fiscal behavior became more sophisticated over time, and that intergovernmental grants are positively related to educational expenditures. In the second section the authors review 26 studies on state grants' effects on educational spending by states and local governments in general, by cities and municipal areas, and by school districts. The following section examines studies on federal aid, including six papers on pre-1966 data and seven on post-1966 data. Six studies are also reviewed on the effects of federal revenue-sharing and unrestricted lump-sum grants on state and local educational spending. Among the findings mentioned in the closing synthesis section are that the magnitude of intergovernmental grants' impact is uncertain and that the impact varies for different types of local governments. (Author/RW)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED224149

IFG

Institute for Research on Educational Finance and Governance

SCHOOL OF EDUCATION STANFORD UNIVERSITY

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

EA 015 238

Project Report No. 82-A14

THE IMPACT OF INTERGOVERNMENTAL GRANTS ON EDUCATIONAL SPENDING

Mun C. Tsang*
Henry M. Levin

July 1982

*Mun C. Tsang is a Ph.D. candidate in the Economics of Education Program, School of Education, Stanford University, and a Research Assistant at IFG.

Henry M. Levin is Professor of Education and Affiliated Professor of Economics, and Director of the Institute for Research on Educational Finance and Governance, Stanford University.

The research for this report was supported by funds from the National Institute of Education (Grant No. OB-NIE-G-80-0111). The analyses and conclusions do not necessarily reflect the views or policies of this organization.

INSTITUTE FOR RESEARCH ON EDUCATIONAL
FINANCE AND GOVERNANCE

The Institute for Research on Educational Finance and Governance is a Research and Development Center of the National Institute of Education (NIE) and is authorized and funded under authority of Section 405 of the General Education Provisions Act as amended by Section 403 of the Education Amendments of 1976 (P.L. 94-482). The Institute is administered through the School of Education at Stanford University and is located in the Center for Educational Research at Stanford (CERAS).

The research activity of the Institute is divided into the following program areas: Finance and Economics; Politics; Law; Organizations; and History. In addition, there are a number of other projects and programs in the finance and governance area that are sponsored by private foundations and government agencies which are outside of the special R&D Center relationship with NIE.

Abstract

This paper assesses the impact of intergovernmental grants on educational spending by reviewing and synthesizing the empirical literature on the subject. It first summarizes the general features and findings of forty published works in this area from the past two decades, and then proceeds to discuss each study briefly. The studies are highlighted for the specific problems they set out to analyze, the models constructed, and the statistical procedure used. The different impacts on educational spending of different types of grants are discussed. Finally, based on the review of these studies, the paper attempts to provide some approximate estimates of the impact on educational spending of categorical grants, matching grants, block grants, and general revenue sharing grants; it also discusses some of the conceptual and statistical issues involved in the empirical analyses which are important for assessing the impact of intergovernmental grants on educational spending.

Contents

Intergovernmental Grants and Educational Spending : An Overview	page 2
State Grants and Educational Spending	page 6
Federal Grants and Educational Spending	page 24
Empirical Effects of Intergovernmental Grants : A Synthesis	page 34
Table 1 : Empirical studies on the impact of state grants on educational expenditures of state and local governments	page 45
Table 2 : Empirical studies on the impact of state grants on educational expenditures of cities and SMSAs	page 46
Table 3 : Empirical studies on the impact of state grants on school district educational expenditures	page 48
Table 4 : Empirical studies on the impact of federal aid on state and local educational expenditures, studies using data before 1966	page 51
Table 5 : Empirical studies on the impact of federal grants on state and local educational expenditures, studies using data after 1966	page 52
Table 6 : Empirical studies related to general revenue sharing aid and federal unrestricted lump-sum aid to state and local governments	page 54
Notes	page 55
References	page 61

This paper assesses the impact of intergovernmental grants on educational spending by reviewing and synthesizing the substantial empirical literature on the subject.[1] It first summarizes the general features and findings of the relevant published works from the past two decades. It is emphasized that the earlier studies used a "determinants" approach to the study of the pattern of educational expenditures of state and local governments. In an attempt to avoid or alleviate a number of conceptual and statistical problems, later studies have used more elaborate models of the fiscal behavior of state and local governments and have used more sophisticated statistical techniques of estimation.

The paper then proceeds to discuss briefly the specific features and findings of each study. The discussion is structured into two parts. The first part consists of studies that examine the impact of state grants to local governments on the educational spending of local governments. The second part reviews studies that treat the impact of federal grants on the educational spending of state and local governments. The studies will be highlighted for the specific problems they set out to analyse, the models constructed, and the statistical procedure used. In discussing the findings of these studies, primary emphasis is given to the impact of the intergovernmental-grant variable on educational spending; other input variables are treated only incidentally. With regard to the impact on educational spending of intergovernmental grants, this paper will call attention to the different impacts of different types of intergovernmental grants[2], and

the different effects of intergovernmental grants on different units of governments.

Finally, based on the review of these studies, the paper attempts to provide some estimates of the impact of different types of intergovernmental grants. However, because of the various conceptual and statistical issues involved in the empirical analysis of the fiscal behavior of state and local governments, these figures should be viewed as approximate estimates. The paper also discusses those issues which are important for assessing the impact on educational spending of intergovernmental grants.

Intergovernmental Grants and Educational Spending : An Overview

There are two kinds of studies which set out to evaluate the impact of intergovernmental grants on educational spending. The first kind restricts its focus to the determinants of educational expenditures only, while the second considers the determinants for total state and local government expenditures and for several selected sub-categories including education.[3] Both kinds of studies on education are included in this review. These studies cover a span of two decades of time, focusing on different types of government units, and employing different methodologies. They include both cross-sectional and time-series studies.[4] The earlier studies are characterized by the "determinants" approach to the study of educational expenditures of state and local governments. The typical determinants study consists of a single equation regression model explaining educational expenditures[5] (on a per capita or per pupil basis) in terms of some independent variables,

including intergovernmental grants, income, population density, property wealth, and others.

Using a least-squares estimation technique, they generally have shown strong and significant effects of intergovernmental grants. However, the precise findings from these studies should not be accepted without considering the possible biases created by their conceptual and statistical problems. A common problem has been the lack of an adequate theory of the underlying fiscal behavior of state and local governments; supply and demand variables, if they are considered, are simply lumped together into a single expenditure equation. The lack of an adequate theory behind the regression model makes it difficult for the researcher to determine the causal relationship among the variables; thus caution must be exercised in using the results of the regression analysis in formulating policies regarding the use of intergovernmental grants. These studies also have not attempted to distinguish the effects of different types of grants. Since different types of grants tend to have different impacts on the level of educational spending, the design of an intergovernmental-grant scheme must take into account the form of the grant. Moreover most of these studies are cross-sectional studies for a single year, the results of which might not be applicable in predicting the spending behavior of local governments over time.

Studies since the latter sixties have paid more attention to those problems than earlier works. In these studies, some theoretical consideration has been given to the spending and taxing behavior of local-government units. Some of these latter studies have set up a system of simultaneous equations which explicitly recognize the

interplay of supply and demand forces affecting educational expenditures; and a two-stage-least-squares procedure (TSLS) is then used to estimate the impact of various factors affecting the level of educational expenditures.[6] Some authors have also chosen to specify a demand-for-education function based on a median-voter, majority-rule model.[7] Other authors have constructed a utility-maximizing model which depicts a government unit as an agent of the people which seeks to maximize the welfare of its people subject to some fiscal constraints.[8] Besides making an effort to more adequately model the spending and taxing behavior of local government units, some of the latter studies have also attempted to differentiate the effects of different types of grants.

Since the results of a cross-sectional analysis are inadequate for predicting the spending behavior of a local government over time, and long-period, time-series data are either expensive or difficult to obtain, some authors have tried different statistical methods to deal with this problem. One method used by these authors is to combine cross-sectional data for several years into a pooled, cross-sectional, time-series form of statistical analysis. Pooling the data for several years together generates more variance in the data set for statistical analysis. Another method is the differencing analysis which uses data in "change" form. That is, changes in expenditure levels between two selected years are related to changes in explanatory variables between the two years.[9] In short, compared to earlier ones, recent studies have used more elaborate models of the fiscal behavior of state and local governments, and have employed more sophisticated statistical

techniques in their empirical estimation of the impact of intergovernmental grants on educational spending.

There are forty published studies reviewed in this paper. In general, they have found significant effects of several factors on educational expenditures: total educational expenditure is positively related to intergovernmental grants for education, negatively related to the price of education services faced by a local district, and directly related to the level of income or property wealth. The level of educational expenditure is also affected by the composition of the local tax base; a district with a lower proportion of residential property (and a higher proportion of commercial property) tends to spend more on education. Other commonly used variables that are found to be important are the age composition of the population, population density, and the extent of urbanization of the region.

In this review, empirical studies are grouped into two categories: studies on state grants to local governments, and studies on federal grants to state and local governments. Each study will be introduced with the specific problem it addresses, the model constructed, and the statistical procedure used. Since the focus is on the intergovernmental-grant variable, primary emphasis is given to an examination of the empirical effects of different types of intergovernmental grants on educational spending.

The impact of an intergovernmental grant is often characterized in the literature by the terms dilutive, substitutive, and stimulative. When the grant results in a reduction in total expenditure, it is considered to be dilutive. When it results in a reduction in expenditure

from local revenue sources (but not in total expenditure), it is substitutive. When it results in an increase in total expenditure, it is stimulative.

State Grants and Educational Spending

State governments have long been a major source of funding for education, and their role in school finance has been acquiring more significance in recent years. In the school year 1959-1960, state governments provided 39.5 percent of the total funding for elementary and secondary schools. Their share in 1969-1970 was 40.0 percent and has since increased to 43.7 percent in the 1975-1976 school year. This upward trend is likely to continue into the eighties. Most state education grants have been awarded to local governments in the form of the "Strayer-Haig-Mort foundation grants." These are "equalization" grants given to school districts with meager property tax resources to enable them to provide at least a minimum educational program (Benson 1978 : Chapter 10).

In conjunction with these foundation grants, the state also provides general aid to local governments in the form of population membership grants or ADA grants. Under this grant scheme, the state gives a flat amount of aid for each child attending a school district as reflected in average daily attendance (ADA). Both foundation grants and flat grants are essentially unrestricted block grants. They increase the income of local governments and reduce the reliance of local governments on local property taxes. Although state categorical grants in education to local governments are provided by many states, they are nominal in

relation to foundation grants. Categorical grants are tied to specific programs or educational services (e.g., school lunches, school construction, and reading). A few states such as Massachusetts, Michigan, and Colorado have used some forms of power equalizing grants and percentage equalizing grants. Under these grants, a state government will match local expenditures, thus lowering the price of educational services for local governments.[10]

Twenty-six published studies on state grants are reviewed in this paper. Except for the studies by Stern (1973), Bowman (1974), Grubb and Michelson (1974), and Cohn (1974, Pennsylvania study), these studies have used total educational expenditure (per pupil or per capita) as the dependent variable.[11] Cohn, Stern, and Grubb and Michelson have used locally-financed educational expenditure as the dependent variable while Bowman has used school district tax. Instead of presenting these studies chronologically, the studies are divided into three subgroups tabulated respectively in Tables 1 - 3.

Table 1 includes studies which have used data aggregated at the state level. One limitation of these studies is that the data are too highly aggregated. Decisions about expenditures, school size, enrollments, and other education-related issues are usually made at local levels (school districts, cities, and counties). Thus to understand the behavioral patterns of local education organizations, one has to analyze data for local educational units rather than state aggregates. Studies on the expenditure patterns of school districts and cities are presented in Table 2 and Table 3 respectively.[12] All

estimates presented in Tables 1 - 3 are statistically significant at the 5% level unless stated otherwise.

Let us first consider the studies in Table 1. Renshaw (1960) used a single-equation regression model to study the determinants of educational expenditures for 48 states. He found that the effects of state education grants were dependent on the choice of data and independent variables used. Using 1949-1950 data and choosing as independent variables state education grant, per capita income, and proportion of nonwhites, Renshaw found that the coefficient[13] for state grant was 0.16. This implies that total educational expenditure will increase by 16 cents for every additional dollar of state education grants. But for the 1953-1954 data, the coefficient rose to 0.38 when he used as independent variables state education grants, per capita income, population density, and an estimate of mandated local revenues per pupil in ADA. However, when this 1953-1954 model was modified slightly, the coefficient changed to 0.51. Sacks and Harris (1964), also using a single-equation regression model, demonstrated that state aid was an important correlate of educational expenditures. The coefficient for state aid was 0.52 for the 1960 cross-sectional data they analyzed.

The substitutive-stimulative effect[14] of state aid indicated by the studies of Renshaw, and Sacks and Harris is supported by Cohn's interstate study (Cohn 1974 : 71-83). Cohn used more recent data to study the effects of state aid for education on five dependent variables: total educational expenditure, average school size, nonpublic enrollment rates, bond sales, and local revenues. These variables were related to a number of independent variables (including state education

grants) and also among themselves on the basis of prior reasoning. Cohn first treated these five equations as independent of one another and applied the ordinary least-squares procedure (OLS). Recognizing the simultaneity of the system of equations, he subsequently used the two-stage-least-squares procedure (TSLS). For each dependent variable, the two coefficients[15] (from OLS and TSLS) for state education grants were quite close to one another in magnitude, but the two corresponding standard errors were very different. For total educational expenditure, the OLS procedure gave a coefficient of 0.34 and a standard error of 0.079 while the TSLS procedure produced a coefficient of 0.36 and an error of 0.21.

McMahon (1970) approached the problem differently. He considered different equations for the demand-for-education, and the production-of-education. Bringing the tax behavior of local governments into his analysis, he transformed the two structural equations into a reduced-form equation in which the ratio of educational expenditure to personal income by state was posited as a function of production costs (e.g., pupil/teacher ratio), demand influences (e.g., age distribution), and a number of other variables including state grants. The results were found to be sensitive to the data used. The level of state grant was shown not to be a statistically significant factor in his 1955-1956 cross-sectional analysis. However for the 1946-1968 time-series analysis, state grant was significant. The coefficient for state grant ranges from 0.82 to 1.06 for various versions of the reduced-form equation.

Table 2 considers the effects of state grants on the educational expenditures of cities and metropolitan areas. Brazer (1959) studied the educational expenditures in 1953 of forty large cities (population more than 250,000 people) across the country. He found that for every additional dollar of a state education grant received, a city would increase its educational expenditure by 29 cents. Pidot (1969) obtained a similar result (32 cents) in his cross-sectional analysis of 81 largest SMSAs (Standard Metropolitan Statistical Areas) in the country in 1962; and he used a principal components analysis of the determinants of local government fiscal patterns.[16] Beginning with a large number of explanatory variables which were thought to be relevant a priori, Pidot applied a principal-components analysis to create a number of uncorrelated measures which he identified as describing certain basic characteristics of the metropolitan areas. These measures were then used along with some specific fiscal measures (including per capita state aid and per capita federal aid) as explanatory variables in standard least-squares regression analysis of the fiscal patterns of the eighty-one SMSAs.

Bishop (1964) considered 1400 towns and cities in the six states in New England. Using per pupil state aid, equalized valuation of property, and number of pupils in average daily membership as independent variables, he found strong and significant effects of state aid in all the states in New England except New Hampshire. The coefficient for state aid ranges from 0.39 for Maine to 0.80 for Massachusetts. The coefficient for New Hampshire is 0.06 and is statistically

insignificant; this is not surprising because state aid constitutes a small part of the funding for education in this state (six percent).

Bishop emphasized that the above results were obtained by considering per pupil educational expenditure only, thus ignoring the differences in size among the 1400 towns and cities. He argued that the use of unweighted data in which large districts and small districts were treated equally in the regression anlysis would be appropriate when one is concerned with the question what is likely to be the effect of additional state aid on the educational expenditure of a local-government unit. However, when one is concerned with the question what is likely to be the effect of state aid on the state-wide average educational expenditure per pupil, the size of the towns and cities should be taken into account; in this case weighted data should be used. Bishop subsequently employed two methods of weighting : weighting by number of pupils and weighting by expenditures. He then found that the coefficients turned out to be either insignificant or negative in most cases. The results indicate, he pointed out, that in the largest towns and cities, state aid did not have a significant influence on educational expenditure and consequently must be a substitute for local tax burden. A negative coefficient indicates that the effect of state aid is equalizing : state aid is higher and local tax burden is reduced in places with relatively low expenditures per pupil. This means that there is an asymmetry in the interpretation of results. When the regression coefficient is positive, a causal effect of state aid on educational expenditure is inferred; when the regression coefficient is negative, no such causal effect is inferred, instead the effect is

assumed to be on the reduction of tax burden. Bishop went on to conclude that while state aid is more stimulative for small towns than large towns, the primary effect of additional state aid on a state-wide basis is the reduction of the property tax burden.

Bishop's result regarding the different effects of state aid on different local government units is corroborated by Campbell and Sacks (1967), and Sacks et al (1972). Campbell and Sacks focused their attention on the educational expenditures of central cities and communities outside central cities in 36 SMSAs across the country. Using 1957 data, they found that the coefficient for state aid for education was 0.42 for central cities and 0.88 for communities outside central cities in the 36 SMSAs. Using 1962 data for thirty-seven SMSAs and a different model, Sacks et al (1972 : 153) found that the coefficient was 0.23 for central cities and 0.61 for communities outside central cities.

While the significant differences between central cities and suburbs around central cities with respect to the effects of per capita income, per capita state aid, enrollment ratio (the proportion of the total resident population attending public schools), and non-educational expenditures on educational spending have generally been recognized, Sacks and Ranney (1966) pointed out that suburban communities were not all of similar character. Using 1962 data for thirty-seven central cities and suburban communities outside the central cities, they showed that differences among suburban areas with respect to per capita income, the enrollment ratio, per capita state aid, and non-educational expenditures were of the same order of magnitude as the differences

between central city and suburb. Relating per capita total educational expenditure to per capita income, enrollment ratio, and per capital state aid, they found that for every additional dollar of state aid to a suburb, total educational expenditure would increase by 84 cents.

Weicher (1972), however, studied the spending behavior of different types of local governments which serve the same population. Specifically he considered central-city governments of SMSAs and school-district governments which satisfy the criteria : (a) school districts and central cities must be coterminous, (b) school districts must be separate political entities, (c) central cities must have at least 50,000 people. He found 106 central cities which received non-matching state aid that satisfy the above criteria.[17] Weicher proposed that, for a given public function, say education, it would not matter whether a state government gives a non-matching education grant to the city government or to the school-district government if both governments serve the same population; the resultant spending pattern will be the same in either case. His central assumption is that aid to either government will have the same effect on expenditure by each government since the marginal propensities to spend on public services, and the desires of the citizens underlying these marginal propensities to spend do not depend on which government is receiving the aid. His analysis of the 1962 data for the 106 central cities confirmed his proposition. This result, Weicher pointed out, has some bearing on revenue-sharing programs; in situations in which several local governments serve the same population, it appears that aid to any one government will have the same fiscal effects as aid to any other government. Weicher found that

the marginal increase in total educational expenditure was 40 cents per additional dollar of state aid.

Another study on city educational expenditures was undertaken by Hu and Booms (1971). In an effort to provide a theoretical basis for their analysis, Hu and Booms employed a community welfare function which took into account competing uses of public funds, the community's income constraint, and factors that affect the demand of a community for public services. The model was represented by a system of equations involving expenditures on each category of government functions (including education), and taxes as dependent variables. Total intergovernmental education grants[18] and a number of socio-demographic factors were used as independent variables. Applying the TSLS procedure, they obtained a coefficient for intergovernmental education aid with a value greater than 1.0 (1.03). But they pointed out that the coefficient did not indicate a purely stimulative effect of intergovernmental education aid because the coefficient was not statistically different from 1.0.

Two recent studies have considered the effects of both state block grants and state matching grants for education on the educational expenditures of towns and communities in Massachusetts. Feldstein (1975) specified a log-linear relationship between total educational expenditure and a number of explanatory variables including state education block grants, property wealth, price of education service, and others. For various forms of the log-linear expenditure function and different sets of data, Feldstein found that the elasticity of total educational expenditure with respect to the price of educational services ranged from -1.6 to -0.94. For the 1970 cross-sectional data,

the estimated price elasticity was -1.0; the elasticity of total educational expenditure with respect to state education block grants was 0.066 which corresponded to a marginal propensity to consume such funds of approximately 0.6.[19]

Feldstein was concerned with how to finance local education to neutralize the effects of differences in local wealth without sacrificing local choice. In his paper, he developed a theoretical model to produce a means of achieving "wealth neutrality", that is, a condition whereby per pupil educational expenditure of a district is not related to a measure of local wealth that emphasizes property value, income, and other similar aspects of community wealth. This involves selecting the proper matching-rate parameter so that the elasticity of total educational expenditure with respect to wealth is zero. His analysis of the educational expenditures of Massachusetts towns and communities suggests that matching grants may be used towards achieving wealth neutrality.

Ladd analyzed the 1970 data for the 78 communities in the Boston Standard Metropolitan Statistical Area. Using a log-linear equation relating total educational expenditure and a number of explanatory variables, she found that the estimated price elasticity associated with state matching grants for education ranged between -0.65 and -0.49. The elasticity for state education block grants was around 0.03, and the elasticity for total intergovernmental education categorical aid (state plus federal categorical aids for education) was 0.11 (the implied marginal propensity to spend was 0.5 and 1.1 respectively). Ladd's emphasis in the study was to show that the composition of the property

tax base would affect local decisions to provide educational services. She found that a district with a higher proportion of residential property (thus a lower proportion of commercial and industrial property) would tend to spend less on education. The tendency of a highly residential community to spend less may be because residential-taxpayer voters will share a larger portion of the tax burden for additional spending than in a community whose tax base is much more heavily commercial and industrial. Ladd also found that commercial property had a stronger positive effect on educational expenditure than industrial property.

Table 3 summarizes empirical studies on the impact of state grants for educational expenditures of school districts. An early study was undertaken by Miner (1963) who considered the determinants of the per pupil educational expenditures in 1127 school districts in 23 states. Taking into account factors relevant to the demand for education (e.g., percent school-aged children in the population of school district), the supply of education (e.g., salary of teachers), and variables reflecting the legal differences among districts in various states (e.g., types of grants, state education aid as a proportion of total educational expenditure), he constructed a single equation relating per pupil total educational expenditure to more than a dozen independent variables. He found that per pupil total educational expenditure was negatively related to the state education aid as a proportion of total educational expenditure. This result is consistent with the fact that poorer districts have lower levels of educational expenditures though they receive relatively more aid than wealthier districts.

Recent studies have concentrated on analyzing intrastate school-district spending behavior. While the studies discussed so far have used total educational expenditure as the dependent variable, some of the recent studies in Table 3 have turned to other dependent variables such as locally-financed educational expenditure and local school tax. Struyk (1970) studied the effects of state aid on the provision of education and welfare services of 140 school districts in New Jersey. His approach was to modify Gramlich's model (1968) to specify state aid as an endogeneous variable so as to take into account the possible joint determination of state aid and local expenditure. Using a TSLS technique and data for the 1965-1966 school year, he found that for every additional dollar of state aid to education, a school district in New Jersey seemed to increase its educational spending by 65 cents.

Stern (1973) analyzed the spending behavior of 157 school districts in Masschusetts using 1968-1969 data. Assuming that local school authorities will show some consistency in evaluating different combinations of local tax rates and educational expenditure when the state aid formula changes, Stern specified a preference function for local school boards including socio-demographic factors, school tax rate, and locally-financed educational expenditure. Assuming that a school board will maximize its preference function with respect to the single control variable, locally-financed educational expenditure, he derived an equation relating locally-financed educational expenditure to a number of explanatory variables including state block grants for education, community income, and other socio-demographic factors. Regression analysis indicates that for every additional dollar of state

education block grants received, a school board will reduce locally-financed educational expenditure by 45 to 55 cents. In other words, total educational expenditure will increase by 45 to 55 cents.[20]

Having estimated the parameters in the preference function, Stern subsequently used the function to simulate the effects of a power equalizing formula. A power-equalizing approach is one that attempts to equalize the power of school districts to raise revenue for education at the same level of tax rate or effort, regardless of differences in wealth.[21] He found that power equalizing grants would reduce the disparities in educational expenditures among school districts due to property-value differences, but not the differences associated with socio-economic status.

Grubb and Michelson (1974) also studied the educational expenditures of Massachusetts school districts. In their study, they applied several models of spending behavior of school districts and found that the results differed significantly among the models.[22] For unrestricted education block grants, they found that locally-financed educational expenditure would decrease by an amount between 19 cents and $1.18 for every additional dollar of such grants. The elasticity of locally-financed educational expenditure with respect to the price of education services ranged between 0.14 and 1.2. When a linear, additive relationship between locally-financed educational expenditure and a number of explanatory variables was used, they found that for every additional dollar of state education block grants received, locally-financed educational expenditure would decrease by 74 cents

(which means that total educational expenditure increases by 26 cents). The effect of state education categorical grants, however, was found to be stimulative; locally financed educational expenditure would increase by $1.21 for every additional dollar of state education categorical grants. They also found that the elasticity of locally-financed educational expenditure with respect to the price of educational services was 0.5 (Grubb and Michelson 1974 : 123-125).

The substitutive-stimulative effect of state aid on the educational expenditures of school districts is further supported by Cohn (1974 : 83-91) and Bowman (1974). Cohn focused his attention on 67 counties in Pennsylvania and used a model developed by Clyde (1973). The Clyde model consists of a system of simultaneous equations relating four endogenous variables to a number of exogenous variables (one of them being state education grant). One of the endogenous variables was per pupil locally-financed educational expenditure. Using the TSLS procedure, Cohn found that for every additional dollar of state education grants received, a county will reduce its own educational expenditure by 12 cents. In other words, total educational expenditure will increase by 88 cents. He pointed out that the result indicated a higher stimulative effect for state education grants in this intrastate study than that found in his interstate study (see Table 1). He noted that while the majority of the states in the country use foundation grants, Pennsylvania is one of the few states that use a percentage-equalizing grant scheme. He suggested, though he could not prove, that the latter scheme might be more stimulative than the former scheme.

In studying the efect of state education grants on educational expenditures, Bowman approached the problem from another direction. Instead of finding the change in educational expenditure per dollar of state education aid, he considered the relation between state education aid and the amount of school tax raised to fund education. He found that for every additional dollar of state education aid received, a school district will lower its tax by 50 cents. His result supports the commonly-held view that a local government will use part of the state aid it receives to reduce its taxes.

Black et al (1979), and Grubb and Osman (1977) both considered the impact of state education block grants on the total educational expenditures of school districts. Black et al analyzed pooled data for the twenty-three regular school districts in Delaware. The study shows that a Delaware school district will increase total educational expenditure by 77 cents per additional dollar of state education block grants received (Black et al 1979 : 161). This result is quite close to that of Grubb and Osman who found a coefficient of 78 cents per dollar of state aid for California unified school districts.

The study by Park and Carroll (1979) of 451 school districts in Michigan, however, indicates a much lower response of school districts to state education aid. The authors found that a Michigan school district would increase its total educational expenditure by only 6 cents and 32 cents per additional dollar of state education block grants and state education categorical grants received respectively. For state education matching grants, their estimate of price elasicity was -0.02, much smaller than those estimated by Feldstein (1975) and Ladd (1975).

Such a low price elasticity implies that a matching grant will not be stimulative (Park and Carroll 1979 : 24).

Vincent and Adams (1978) investigated the fiscal responses of school districts in two states, Colorado and Minnesota. They used the 1973 and 1975 data for Colorado, and the 1972 and 1976 data for Minnesota. They carried out one-year cross-sectional studies, as well as a differencing analysis for each state between the two years of each data set. For Minnesota, they found that total educational expenditure per pupil would increase by 41 cents and 28 cents for each additional dollar of state education block grants received in 1972 and 1976 respectively. This implies that Minnesota school districts on the average used an extra dollar of state education block grants to reduce local taxes by 59 cents and 72 cents in 1972 and 1976 respectively. In the differencing analysis, Vincent and Adams related the changes in total educational expenditures between the two years to changes in the explanatory variables between the two years. They found that school districts would spend an additional 49 cents for every additional dollar of state education block grants received. This suggests that the property tax reduction impact may be somewhat lower over time than the impact that could be inferred from the one-year type cross-sectional analyses.

As for state categorical grants for education, the coefficient was 1.33 for 1972 and 1.07 for 1976. The differencing analysis yielded a coefficient of 0.80 for state categorical grants for education, indicating that there may be some substitution over time of state education categorical aid for local property taxes not indicated by the

cross-sectional analysis. Similarly for Colorado school districts, the coefficient for state categorical grants for education was 1.6 and 1.8 for 1973 and 1975 respectively; the differencing analysis for changes between 1975 and 1973 yielded a coefficient of 0.85.

Adams (1979, 1980) continued her study of the fiscal responses of school districts in several other states. In her 1979 four-state study, she found that the estimated elasticities of total educational expenditure with respect to the price of education services was quite small compared to those reported by Feldstein (1975) and Ladd (1975), but was closer to that reported by Park and Carroll (1979). For school districts in Colorado, the estimated price elasticity ranged between -0.09 and -0.08; for school districts in Wisconsin, it was between -0.22 and -0.19. For state education categorical grants, the estimated marginal propensity to spend was 0.17 for Colorado, 0.5 for Kansas, 0.7 for Maryland, and close to 1.7 for Wisconsin. The estimated marginal propensity to spend out of foundation grants was in the range 0.6 to 0.7 for school districts in Maryland.

Adams also found that other components of a school aid structure, such as the nature and scope of spending limitation, and/or the differential treatment of districts on the basis of size or other criteria could affect the impact of a state education grant. She cited the results for Colorado and Wisconsin, two reform states that have adopted equalizing reforms in educational finance which use a Guaranteed Tax Base formula (GTB). As reflected in the coefficient of variation, Colorado experienced an increased disparity in spending among its school disticts while the disparity in spending among Wisconsin school

districts decreased. Adams pointed out that although both states used a GTB, their school aid structures differed significantly in other respects. Colorado's spending limitation was effectively uniform for low-spending and high-spending districts. Wisconsin, however, used a disincentive for increased spending (beyond the limit) that affected high-spending districts far more quickly than low-spending districts. Colorado also had a minimum flat grant guarantee which distributed some amount of aid to even the wealthiest districts, while Wisconsin was getting rid of major flat grants from its school finance structure.

In her 1980 study of New York state school disticts, Adams found that, on the average, total educational expenditure would increase by 59 cents for each additional dollar of state education block grants received, and $1.06 for each additional dollar of state education categorical grants awarded by the state government. However, she found that the marginal propensity to spend out of a state education block grant differs between upstate school districts (0.68) and downstate school districts (0.05); the results also indicate that downstate school districts tend to spend more out of additional dollars of personal income for education services than upstate school districts. This suggests that the individual characteristics of school districts affect the fiscal response to state aid and any statistical analysis of averge behavior may differ significantly from individual district behavior.

Adams (1980) also considered two other issues : prices of school inputs, and effects of non-education services on educational expenditures. Since the prices of school inputs may vary among school districts, nominal educational expenditure may not reflect the real

level of education services provided. Using an index of the variation of input prices for New York school districts developed by Windling (1980), Adams adjusted nominal total educational expenditure into "real" total educational expenditure. She found that the analysis of nominal total educational expenditure indicated that a percent increase in general state aid would increase nominal total educational expenditure by 0.07 percent. However, when total educational expenditure was analyzed in real dollars, the response measure was lower, only 0.04 percent. She also found that total educational expenditure was positively related to expenditure on non-education services.

This review has considered twenty-six published studies on the impact of state grants on the educational expenditures of various types of local governments. From the findings of these studies, it is obvious that the impact of a state grant on educational spending depends crucially on the type of state aid and the individual characteristics of a local government receiving the aid. It is also clear that in the empirical estimation of the coefficient for the state-aid variable, the precise value of the coefficient is affected significantly by the model used, the type of analysis employed (time-series versus cross-section), and the data used. It will be evident to the reader that some of these observations on the empirical studies related to state grants are also applicable to studies of federal grants.

Federal Grants and Educational Spending

Though federal involvement in education has been increasing since the passage of the 1965 Elementary and Secondary School Act, its

significance at 8% of total expenditures has been relatively modest compared to state and local involvement. Most of the federal grants for education take the form of categorical grants targeted for specialized education programs, the largest grant being the one for the Title 1 programs of the Elementary and Secondary School Act of 1965 which provides compensatory education for children from low-income families. Open-ended matching education grants have not been commonly used by the federal government.

Thirteen studies on federal grants for education are reviewed in this paper. They are divided into two groups and are presented in Table 4 and Table 5 respectively. Table 4 consists of studies which used data before 1966, data for a time period in which federal involvement in education was minimal. Table 5 consists of seven recent studies which have used data after 1965. Since grants to Title 1 programs constitute a large portion of federal education aid to state and local governments, some of the studies in Table 5 have chosen to divide federal education aid into two parts : Title 1 grants, and other non-Title 1 federal education grants; and the effects of these two parts of federal education aid are considered separately. The estimates presented in these two tables are statistically significant at the 5% level unless stated otherwise.

There is, however, another type of federal grant to state and local governments which will affect educational spending; it is a general revenue sharing grant (GRS grant). Revenue sharing refers to the scheme by which the federal government returns a portion of federal revenue to state and local governments to use as they see fit (Nathan et al

1975). Since the purpose of revenue sharing is to augment state and local government revenues, it should not be viewed as a system of grants to support any particular public service like education. The specific effects of revenue sharing on educational spending depend crucially on the relative preferences of state and local governments receiving GRS grants for using additional revenues on education as opposed to other public goods. Studies of the impact of revenue sharing aid are tabulated in Table 6.

First, let us consider the studies in Table 4. Osman (1966) obtained a large and statistically significant coefficient for federal education grants (a 5.11 marginal propensity). In his cross-sectional study, he argued that federal grants to other non-education functions would also affect educational expenditures because funds from these federally-aided, non-education functions might be released for use in education. Thus in his one-equation model, total educational expenditure was made a function of per capita income, number of students attending local public schols per 1000 of state population, federal grants for education, as well as federal grants to non-education functions. He found that the effects of non-education federal grants on total educational expenditure was statistically significant and the coefficient was positive.

Pogue and Sgontz (1968) questioned Osman's finding that federal grants were purely stimulative. In their study, they analyzed expenditure for all levels of education, and expenditure of local schools in 48 states for a period of seven years, 1958-1964. The impact of federal education grants was found to be different for these two

kinds of expenditure. For local-school expenditure, the coefficients for federal education grants for the seven years were respectively -0.25, 1.22, 1.23, 1.17, 0.10, 1.18, and 1.72. None of these coeficients was statistically greater than 1.0. Thus federal education grants are not necessarily purely stimulative. For expenditure on all levels of education, the coefficients for federal education grants for the seven-year period were 3.83, 4.92, 4.19, 4.61, 2.99, 3.36, and 4.33; all except the first value (3.83) were statistically greater than 1.0, at the 0.05 percent level. The fluctuating values of the coefficient for federal education grants indicate that state and local governments may not be in a state of budgetary equilibrium; they may reflect a process of frequent budgetary adjustment. Thus it is unwarrranted to claim that the result of a cross-sectional analysis on a given year is applicable to an extended period of time in assessing the impact of federal grants.

In his cross-sectional analysis, Smith (1968) found that each additional dollar of federal education aid was associated with an increase of $1.69 in total educational expenditure. However, the estimate was not statistically different from 1.0. In contrast, Pidot (1969), found that the effect of federal grants was substitutive-stimulative but, statistically, not significantly differrent from zero. His estimated coefficient was 0.13.

More recent studies by Booms and Hu (1971), and O'Brien (1971) however, provide some evidence that federal grants may be purely stimulative. In their study, Booms and Hu formulated a simultaneous-equation model to distinguish demand aspects from supply aspects in an attempt to identify and thus measure the determinants

affecting the demand for and supply of public education. Using the TSLS procedure, they obtained a value of 1.68 for the marginal propensity to spend out of federal education grants.

O'Brien's article investigates the simultaneous determination of grants and expenditures, the question of whether federal funds stimulate or substitute for state-local expenditures, and the effect of individual state characteristics on statistical estimates. Using a pooled-data sample of 48 states and different estimation techniques (OLS, TSLS, and Generalized Least-squares), he concluded that grants and expenditures were not simulataneously determined, that federal grants would stimulate state-local expenditures of their own funds on aided categories and cause expenditure reduction on unaided categories, and that the effect of individual state characteristics was important. One estimate suggested that each additional dollar of federal education aid will stimulate an additional 67 cents from the government receiving the aid.

Next we consider the studies for the post-1965 period in Table 5[23]. Most of these studies have been mentioned in the preceding section under state grants and educational spending. Grubb and Michelson (1974) have found a significant and very stimulative effect of Title 1 federal grants on the education expendiures of 159 school districts in Massachusetts. They estimated that for each additional dollar of Title 1 aid received, a Massachusetts school district will, on the average, raise its own educational expenditure by $4.4, that is, total educational expenditure will increase by $5.4 for each additional dollar of Title 1 aid. As for other non-Title 1 aid, the effect is substitutive-stimulative : total educational expenditure will increase

by 50 cents for each additional dollar of non-Title 1 federal education aid.

The result of Feldstein's study (1978) on Title 1 federal aid was in sharp constrast to that of Grubb and Michelson. Feldstein analyzed the total educational expenditures of 4690 school districts across the country. Using 1970 data, he found that Title 1 federal aid had a significant but substitutive-stimulative effect on the total educational expenditure of a school district. For every additional dollar of Title 1 federal aid received, a school district will increase its total educational expenditure by 72 cents. As for non-Title 1 federal education aid, Feldstein found that a school district will raise its total educational expenditure by 41 cents for each additional dollar of such aid, a result comparable to that of Grubb and Michelson. A number of other studies have also considered the effect of federal categorical grants on total educational expenditure. Most of them have yielded a value close to 1.0 for the marginal propensity to spend out of federal education categorical grants.

Ladd (1974) found that a Massachusetts school district will tend to increase total educational expenditure by $1.10 for each additional dollar of federal education categorical grants.[24] Adams (1979) found a value between 1.05 and 1.18 for Maryland school districts and 0.65 for Wisconsin school districts. As for Colorado school districts, Vincent and Adams (1978) have estimated that the marginal increase in total educational expenditure was 1.6 for the 1973 data, 0.87 for the 1975 data, and 1.46 for the differencing analysis using changes in data between 1973 and 1975. Likewise, Vincent and Adams (1978) found that the

marginal increase in the total educational expenditure of a Minnesota school district was 1.3 in 1972, 0.89 in 1976, and 0.81 from the differencing analysis using changes in data between the two years. Park and Carroll's study of Michigan school districts is a study showing a substantially lower marginal increase in total educational expenditure; the estimated marginal spending out of each dollar of federal aid was 38 cents.

Craig and Inman (1982) studied the impacts of different types of federal grants on the amount of state education aid to local educational authorities (LEAs). They constructed models for the fiscal behavior of both state and local governments. The model for a state government consisted of a state-aid equation, a tax equation, and a budget constraint. The model for a local government was comprised of equations for each of the major components of local expenditure, a tax equation, and a budget constraint. Using pooled data for 48 contiguous states and the generalized least-squares technique, they found different effects for different types of federal grants. The effects were statistically significant for pass-through federal education aid (PTEA, categorical education aid such as Title I of ESEA that is given to the states with the requirement that such assistance be passed-through to the LEAs for spending on schooling with no reduction in current state education aid), by-pass federal education aid (BPEA, categorical education aid given directly to LEAs thereby "by-passing" the states), and federal matching education aid (MEA, categorical education aid requiring a limited match by state and local governments); but a fourth type of federal grant, an unconstrained general purpose aid given to state and/or LEAs, was found

to be statistically insignificant. An additional dollar of PTEA was found to stimulate an additional 32 cents of state education aid to LEAs, but the estimates showed a state reduction in aid to LEAs of $1.55 and $1.37 for every additional dollar of BPEA and every additional dollar of MEA respectively.

Using their models and these estimates, the authors found that each additional dollar of PTEA was associated with an increase of 73 cents in local-school expenditures, but each additional dollar of BPEA led to a reduction of 25 cents in local-school expenditures. Having estimated the parameters in their fiscal models of state and local governments, Craig and Inman then went on to simulate the effects of different federal grant policies. In particular, for a new federal policy that cuts federal education aid by 25% and which is coupled with a consolidation of all aid into an unregulated lump-sum grant, the simulation shows that national spending on public education will be reduced from $670 per enrollee to $616 per enrollee, an eight percent per child reduction. Also financial responsibility for public education will be shifted from the federal and state levels of government to the local level.

Table 6 presents those studies which have addressed the impact of an unrestricted lump-sum grant (including GRS grant) on the total public expenditures of state and local governments. Such a grant is not tied specifically to education; it is used in whatever ways a government receiving the grant sees fit. Using a survey approach, Nathan et al (1975) tried to determine how a state-local government would spend each dollar of GRS funds. They found that out of each dollar of GRS funds, there were allocations of 26 cents for new spending (1975 : 198, 206,

209), 15 cents for program maintenance (1975 : 223), 30 cents for tax reduction or stabilization (1975 : 217, 221), and the remaining 29 cents went to fund balances, and/or avoidance of borrowing. They also found that there were substantial differences in the use of GRS funds among different local governments. A fiscally hard-pressed local government tended to devote a greater portion of GRS funds to substitution; a fiscally strong local government would use more GRS funds on new spending. Population size also matters : local units of more than 100,000 residents devoted a smaller portion of GRS funds to new spending than that of smaller jurisdictions (population under 50,000 residents) (1975 : 229-230). A more recent study put the proportion of new spending at 24% of total revenue sharing aid (Nathan et al 1977 : 116-119); and substantial differences in the use of GRS funds among different local governments continued to exist.

Differences in spending patterns among local governments of different population size were also found in Juster's study (1976). Using a survey approach, Juster found that the dominant impact of revenue sharing in large cities (those over 300,000 residents) was to maintain operating expenditures, while in cities with less than 100,000 residents, the dominant effect was to facilitate new capital spending. Besides differences by population size, Juster also found differences in spending patterns by geographical location; in particular, tax abatement impacts were relatively stronger in the Northeastern part of the country than elsewhere (1976 : 13).

Nathan's estimate of 26 cents for new spending was quite close to the econometric estimates of Gramlich (1968), and Gramlich and Galper

(1973). Using a utility-maximization model for the fiscal behavior of a state-local government, Gramlich (1968) found that for every additional dollar of unrestricted federal block grants, general public expenditure will increase by 28 cents. Gramlich and Galper (1973) used a utility-maximization model to study the impact of an unrestricted lump-sum grant on the total public expenditures of state and local governments. Using pooled data (1962-1970) for ten urban governments, the coefficient obtained was 0.25. Using time-series data (1954-1972) for 48 states, the coefficient was found to be 0.43

Inman's study (1971), however, found a much larger effect. He considered the relation between city public expenditures on major public functions and total intergovernmental unrestricted lump-sum aid from all sources[25]. In his study, Inman adopted an analytical approach that characterizes the local government decision-making process by the optimization of a "leadershop preference function" subject to a budget constraint. The "leadership preference function" chosen was of the "Stone-Geary" specification which in essence is an expression relating expenditure to other relevant variables that affect expenditure. Using the 1966-1967 data for 41 major cities, he found that for each additional dollar of intergovernmental aid, total city expenditure on all its major functions will increase by about $1.34. Out of the $1.34, 93 cents will be spent on education.

Econometric studies which have tried to determine the impact of GRS aid on educational spending have consistently found no statistical relationship between educational spending and GRS aid.[26] As noted previously, revenue sharing funds are not tied to any specific public

services; they are used in whatever ways a state or local government sees fit. One way to estimate the fraction of a revenue-sharing dollar that is spent on education is as follows. First, estimate how much new spending is generated from a dollar of revenue-sharing aid as opposed to other uses such as program maintenance or tax reduction. Second, estimate the proportion of the new spending that goes to education. Most of the studies in Table 6 show that for every dollar of GRS aid, 25 cents to 43 cents will go to new spending. While it is difficult to determine exactly what proportion of the new GRS spending is devoted to education, it is known that 20 to 25 percent of average state-local expenditures have been allocated to local schools in the years 1968-1969 to 1976-1977 (U.S. Department of Commerce 1980 : 45). When this average is applied to the GRS new spending category, it suggests that five to ten percent of GRS aid is allocated to new educational spending. It is interesting to note that the figure is quite close to the independent estimate by Juster (1976 : 58) that the percentage of GRS aid spent on education is between 3.8 and 6.1 percent.

Empirical Effects of Intergovernmental Grants : A Synthesis

Forty empirical studies on the impacts of intergovernmental grants on educational expenditures have been discussed in this review. These studies cover two levels of intergovernmental grants, federal grants to state and local governments, and state grants to local governments. They extend over a two decade period and have analyzed the spending behavior of cities, counties, and school districts. Although there are differences among them with regard to the method of analysis used and

the units of governments examined, the findings of these studies do lend themselves to some generalization about the responses of state and local governments to intergovernmental grants. In general, these studies have found significant effects of intergovernmental grants and a few socioeconomic and demographic factors such as property wealth, personal income, population density, age distribution, and the composition of local tax base on the level of educational expenditures of local governments.

Most of the studies on unrestricted state block grants for education (or general state equalization aid in the form of foundation grants and/or flat grants) indicate that the effect of such grants on the total educational expenditure of a local government is substitutive-stimulative. A local government receiving such a grant will typically use part of the grant for educational services; thus in this respect, the impact of the grant is stimulative. The local government, however, will also use part of the grant on non-educational activities. It may use some of the state aid for other government functions or it may use it to reduce the local tax burden; in this respect, the state block grant is a substitute for local expenditure. The marginal propensity to spend state block grants for education reported in the empirical studies ranges from a low of 0.16 to a high of 1.06. However most of the values do lie within the smaller range 0.3 to 0.7. An approximate estimate for the marginal increase in total educational expenditure per additional dollar of unrestricted state block grants for education is 50 cents.

For the few states that have employed some forms of matching grants for education which lower the price of education services for a local government, empirical studies have found a negative relationship between total educational expenditure and the price of education services. However, the estimated price elasticity implies that the response of a local government is either quite responsive or not responsive at all. The estimated price elasticity is -1.0 for Feldstein's 1975 study of Massachusetts, -0.65 to -0.49 for Ladd's 1975 study of Massachusetts, -0.02 for Park and Carroll's 1979 study of Michigan, and -0.09 to -0.08 for Adams's 1979 study of Colorado. Thus the precise impact of a state matching grant for education seems to depend critically on the characteristics of a local government receiving the grant; it is inadvisable to generalize the experience of school districts in one state to school districts in another state.

As for state categorical grants for education, the estimated coefficients range from 0.17 to 1.8. Thus such a grant is substitutive-stimulative for some school districts but purely stimulative for other school districts. But, a number of recent studies have indicated that for each additional dollar of state categorical grants for education, total educational expenditure will increase by an amount close to one dollar; there is little stimulation of locally-financed educational expenditure. On the average, however, state categorical grants for education appear to be more stimulative than state unrestricted block grants for education. This may be due to the fact that a categorical grant usually has more strings and requirements attached to it than an unrestricted block grant, so that the government

receiving the grant is induced to spend more on the categorical program per dollar of aid.

Since federal involvement in education has become more substantial only after 1965, a current focus should rely more heavily on the studies that analyse the responses of state and local governments to federal aid after 1965. Among the studies discussed previously on federal categorical grants for education, the most extensive is the study by Feldstein (1978). This research indicates that for each additional dollar of federal categorical grant for education, there is an increase of 72 cents in local educational expenditure; a similar estimate (73 cents) is provided by Craig and Inman (1982). Other studies (Ladd 1974; Vincent and Adams 1978; Adams 1979), however, have found that the increase in local educational expenditure was as high as one dollar or even more. Based on these studies, one may conclude that an additional dollar of a federal categorical grant for education is associated with an increase of 70 cents to one dollar of local educational expenditure.

With regard to federal matching grants for education, there is not much work done in the literature because the federal government has seldom used matching grants for education. A recent study by Craig and Inman (1982) has indicated that a state will reduce its aid to a local government which receives aid from the federal government. The impact of a federal matching grant may thus be less stimulating than a state matching grant.

Most of the studies on GRS grants and unrestricted lump-sum grants have found that 25 to 43 percent of GRS funds will go to new spending. Assuming that a state-local government spends 20 to 25 percent of its

total expenditure on local schools, five to ten cents of GRS funds will be spent on education for every dollar of GRS funds.

Although the link between intergovernmental grants and the level of educational expenditures has been firmly established, the exact magnitude of the relationship between them is still subject to disagreement. This disagreement among authors of empirical studies is hardly surprising when one recognizes the widely different units of governments they have studied, and the different analytical approaches they have adopted. One can see from the previous discussion that the coefficient for intergovernmental grants can be different between cross-sectional studies and time-series studies for the same entities. Also, the estimates appear to change according to the formulation of the statistical model. Moreover, for the same set of government units examined and the same model formulation used, a cross-sectional analysis often yields different values for the coefficient for intergovernmental grants when different time periods are considered. Furthermore, the impact of intergovernmental grants on educational spending is different for different groups of government units. These different results illustrate some of the conceptual and statistical problems in the empirical estimation of the effects of intergovernmental grants on educational expenditures; they also bring attention to some of the issues that one should be aware of in interpreting the findings of these empirical studies.

A major problem in the empirical estimation of the impact of intergovernmental grants is the lack of an adequate understanding of the underlying behavior governing the spending patterns of state and local

governments. Researchers have used a number of explanatory variables that have been found to be significantly correlated with the level of educational expenditure. But there is no consensus among them as to what the underlying spending behavior of a government is and how these explanatory variables influence such spending behavior. There are many different types of government units and their complex fiscal patterns and spending behavior are very difficult to analyse. Consequently researchers have used different procedures and different theoretical models. One finds that for the same data set and government units examined, different models or modifications of a given model can yield significantly different estimates for the impact of an intergovernmental grant on educational spending. The lack of an adequate theory behind a regression model makes it hard to establish a causal relationship between an output variable and an input variable.

Another problem concerns the non-random distribution of state education aid to local governments. The coefficient for state grants for the empirical studies discussed above may not provide an estimate of the "true" average response of local governments. State grants are not randomly distributed among local governments. Rather, they are distributed among local governments according to some specified formula which often favors poor districts in order to more nearly equalize their ability to provide educational services. If poor districts have a higher marginal propensity to spend out of state aid than that of rich districts, then the coefficient will overstate the average response for a more representative sample of districts. If, on the other hand, poor

districts have a lower marginal propensity, then the average response will be understated.

Most of the empirical studies on educational expenditure are cross-sectional studies which analyze the spending behavior of local governments at a point in time. Cross-sectional studies are adequate for investigating differences in educational expenditures among local governments; but they are inadequate for analyzing the spending behavior of a local government over time. Some of the empirical studies have shown that a cross-sectional analysis often yields significantly different values for the regression coefficient for intergovernment grants when different time periods are considered. This suggests that the local governments examined may be in a budgetary disequilibrium. Thus it may be misleading to rely upon the results of a single year, cross-sectional study in estimating the response of a local government to an intergovernmental grant. Vincent and Adams (1978) has shown that a differencing analysis which employs changes in data between two years can yield a higher marginal propensity to spend out of unrestricted state block grants than those suggested by cross-sectional analyses of the two years separately. Her differencing analysis has also yielded a lower marginal propensity to spend out of state categorical grants than those suggested by cross-sectional analyses of the two years separately.

The empirical literature on educational expenditure has shown clearly that the impact of an intergovernmental grant can be very different for different groups of local governments. For example, Campbell and Sacks found thaschool districts in downstate New York had a much lower marginal propensity to spend unrestricted state block grants

than those of upstate New York, but the downstate school districts spent more out of personal income than upstate districts. These findings suggest that the individual characteristics of a local government do strongly influence the fiscal response of the local government to state aid. A statistical analysis of average district behavior may depart significantly from individual district behavior. Under a fiscal federalism, variations among state and local governments have been a source of difficulty for designing a grant scheme for any public service. Since there are so many different types of government units, and their fiscal patterns and spending behavior are so complex, it is hard to predict precisely how a particular government will respond to a given grant scheme (Reischauer 1977).

From the perspective of a policy-maker on grant provision, knowledge of a more precise estimate of the response of a local government receiving a grant is desirable. In interpreting the results of an empirical study, the policy-maker not only has to pay attention to the estimated average response of local governments to an intergovernmental grant, but also to the variance in the responses. Consider, for example, the study by Cohn (1974, interstate study). Cohn found that for every additional dollar of state aid received, a local government in his study will, on the average, increase its total educational expenditure by 36 cents. There is, however, considerable variance in the response among the local governments in his study. The standard error for state aid is 0.21. Thus a local government in the sixteenth percentile will spend only 15 cents per additional dollar of state aid, while a local government in the eighty-fourth percentile will

spend an additional 57 cents for every additional dollar of the aid. For a policy-maker pondering over the amount of aid to give to a local government so as to achieve a certain level of educational expenditure, the two responses certainly mean very different things to him or her.

Relevant to the consideration of the different responses of local governments are the empirical findings on the degree of variability in the responses of local governments to different types of intergovernmental grants. For state block grants for education, most of the empirical studies found that the standard error was half or even less of the estimated effect. Compared to state block grants for education, state education categorical grants had a standard error which corresponded to an even smaller proportion of the estimated effect.[27] For federal Title 1 categorical grants, the standard error was found to be a quarter or even less of the estimated effect.[28]

Sometimes a policy-maker may want to examine the response of particular groups of local governments instead of the average response of all local governments. Consider, for example, Title 1 grants which are targeted for compensatory education of children from low-income families. Since the grants are used to provide compensatory education for such children, the response of poor districts which contain a high proportion of children from low-income families is of more interest to the policy-maker than the response of wealthy districts containing a very low proportion of children from low-income families, or the average response of all school districts.

Finally, in assessing the impact of an intergovernmental grant, one should also take into account the structure of the school-aid system.

Adams (1979) has shown that the other components of a school aid structure can affect the impact of an intergovernmental grant on local spending on educational services. Osman (1966) and Adams (1980) have also shown that educational expenditures and non-educational expenditures are correlated. Osman found that total educational expenditure was positively related to the amount of federal aid to non-education services. Since funds from federally-aided non-education services may be released for used on education, federal funds for non-education services can have a positive income effect on the level of educational expenditure. Adams, likewise, found that total educational expenditure was positively related to expenditure on non-education services. But to complicate matters, Craig and Inman (1982) found that for federal categorical aid that passed through the state, the state would increase its aid to local governments, but it would decrease its aid to local governments when the federal categorical aid by-passed the state to local governments.

In conclusion, the empirical studies reviewed in this paper give a range of estimates that enables one to assess the relative impact of different forms of grants by higher levels of government on the educational spending of lower levels of government. By providing a picture of the ranges of responses associated with different grant structures under different conditions, they assist in the development of federal and state grant policies. However, variations among state and local governments make it difficult for us to predict precisely the response of a government to a given grant scheme. The empirical studies have shown that the extent of the impact of an intergovernmental grant

on educational spending depends heavily on the characteristics of a government receiving the grant; different governments may respond very differently. Thus in designing a grant scheme to stimulate educational spending, one should also consider the degree of variability in the responses of different governments besides estimating the average response of the governments to the scheme.

Table 1 : Empirical studies on the impact of state grants on educational expenditures of state and local governments.

Author (Date of Publication)	Data (Cross-sectional analysis unless stated otherwise)	Dependent Variable (Educational Expenditure, E)	Independent Variable (Grant, G)	Response (Marginal change, dE/dG)
Renshaw (1960)	48 states, 1949-1950	per pupil total expenditure in state school system	per pupil state aid for education	0.16, significant at 10% level
	48 states, 1953-1954	per pupil total expenditure in state school system	per pupil state aid for education	0.38 to 0.51 for several versions of model
Sacks & Harris (1964)	48 states, 1960	per capita total local school expenditure	per capita state aid for education	0.52
McMahon (1970)	50 states, 1946-1968 time-series	total expenditure to income ratio	state grant to income ratio	0.82 to 1.06 for several versions of model
	50 states, 1955-1956	total expenditure to income ratio	ratio of state grant to educational expenditure	0.001 to 0.002 insignficant
Cohn (1974)	49 states, 1967-1968	per pupil total expenditure in ADA	per pupil state grant for education	0.34

Table 2 : Empirical studies on the impact of state grants on educational expenditures of cities and SMSAs

Author (Date of Publication)	Data (Cross-sectional analysis unless stated otherwise)	Dependent Variable (Educational Expenditure, E)	Independent Variable (Grant, G)	Response (Marginal change, dE/dG unless stated otherwise)
Brazer (1959)	40 large cities across country, 1953	per capita total city expenditure	per capita state grant for education	0.29
Bishop (1964)	1400 towns and cities in New England, 1961-1962	per pupil total town or city expenditure	per pupil state aid for education	0.68 for Conn., 0.39 for Maine, 0.80 for Mass., 0.06 for New. Hamp. 0.51 for Rhode Is. 0.76 for Vermont.
Sacks & Ranney (1966)	Suburbs of 37 SMSAs across country, 1962	per capita total expenditure of suburb	per capita state aid for education	0.84
Campbell & Sacks (1967)	36 SMSAs across country 1957	per capita total expenditure of central city	per capita education aid	0.42
		per capital total expenditure of outlying districts	per capita education aid	0.88
Pidot (1969)	81 largest SMSAs in 1962 in U.S.	per capita total expenditure	per capita total state aid	0.32

Hu & Booms (1971)	31 large cities, 1962	total city expenditure	state and federal grant for education	1.03
Sacks et al (1972)	37 SMSAs across country 1962	per pupil expenditure of central city	per pupil state aid for education	0.23, statistically insignificant
		per pupil expenditure of outlying areas	per pupil state aid for education	0.61
Weicher (1972)	106 large central cites, 1962	per capita total city expenditure	per capita state grant	0.40
Feldstein (1975)	105 towns in Mass., 1970	per pupil total town expenditure	per pupil state block grant for education	0.6
		per pupil total town expenditure	price of education services	price elasticity = -1.0
Ladd (1975)	78 communities in Mass., 1970	per pupil total community expenditure	per pupil state block grant for education	0.5 (elasticity equals 0.03)
		per pupil total community expenditure	price of education services	price elasticity ranges between -0.65 and -0.49

Table 3 : Empirical studies on the impact of state aid on school district educational expenditures.

Author (Date of Publication)	Data (Cross-sectional analysis unless stated otherwise)	Dependent Variable (Educational Expenditure, E)	Independent Variable (Grant, G)	Response (Marginal change, dE/dG unless stated otherwise)
Miner (1963)	1127 school districts in 23 states, 1959-1960	per pupil total expenditure	state education aid as a percentage of total educational expenditure	negatively related
Struyk (1970)	140 school districts in New Jersey, 1965-1966	per pupil total expenditure	per pupil state aid	0.65, statistically insignificant
Stern (1973)	157 school districts in Mass., 1968-1969	per pupil locally-financed expenditure	per pupil state block grant for education	between -0.55 and -0.45
Bowman (1974)	55 county-wide independent school districts in West Virgina, 1969-1970	per pupil school district tax	per pupil state block grant for education	tax decreases by 50 cents per dollar of state block grant for education
Cohn (1974)	67 counties in Pennsylvania 1970	per pupil locally financed expenditure	per pupil state grant for education	-0.12, significant at 10% level
Grubb & Michelson (1974)	159 school districts in Massachusetts, 1968-1969	per pupil locally financed expenditure	per pupil state block grant for education	-0.74, statistically insignificant
			per pupil state education categorical grant	1.21, significant at 10% level
			price of education services	elasticity equals 0.5, insignificant

Grubb & Osman (1977)	234 unified school districts in California, 1971-1972	per pupil total expenditure	per pupil state block grant for education	0.78
Vincent & Adams (1978)	school districts in Colorado, 1973 & 1975	per pupil total expenditure	per pupil state education categorical grant	1.6 for 1973, 1.8 for 1975
		change in per pupil total expenditure between 1975 and 1973	change in per pupil state education categorical grant between 1975 and 1973	0.85
	school districts in Minnesota, 1972 & 1976	per pupil total expenditure	per pupil state block grant for education	0.41 for 1972, 0.28 for 1976
		change in per pupil total expenditure between 1976 and 1972	change in per pupil state block grant for education between 1976 and 1972	0.49
		per pupil total expenditure	per pupil state education categorical grant	1.33 for 1972, 1.07 for 1976
		change in per pupil total expenditure between 1976 and 1972	change in per pupil state education categorical grant between 1976 and 1972	0.80
Adams (1979)	school districts in Maryland, 1972 to 1976 pooled data analysis	per pupil total expenditure	per pupil state block grant for education	0.6 to 0.7
			per pupil state education categorical grant	0.7

	school districts in Kansas, 1973 to 1975 pooled data analysis	per pupil total expenditure	per pupil state education categorical grant	0.5
	school districts in Colorado, 1977	per pupil total expenditure	price of education services	elasticity between -0.09 and -0.08, insignificant
			per pupil state education categorical grant	0.17
	school districts in Wisconsin, 1973-1974 & 1975-1976 pooled data analysis	per pupil total expenditure	price of education services	elasticity between -0.22 and -0.19
			per pupil state education categorical grant	1.7
Black & Lewis & Link (1979)	school districts in Delaware, 1970-1973 pooled data analysis	per pupil total expenditure	per pupil state block grant for education	0.77 (elasticity equals 0.66)
Park & Carroll (1979)	451 school districts in Michigan, 1971-1976 pooled data analysis	per pupil total expenditure	per pupil state block grant for education	0.06 (elasticity equals 0.005)
			per pupil state education categorical grant	0.32 (elasticity equals 0.017)
			price of education services	-0.02
Adams (1980)	school districts in New York, 1976-1977	per pupil total expenditure	per pupil state block grant for education	0.59
			per pupil education categorical grant	1.06

Table 4 : Empirical studies on the impact of federal aid on state and local educational expenditures, studies using data before 1966.

Author (Date of Publication)	Data (Cross-sectional analysis unless stated otherwise)	Dependent Variable (Educational Expenditure, E)	Independent Variable (Grant, G)	Response (Marginal change, dE/dG unless stated otherwise)
Osman (1966)	48 states, 1960	per capita total expenditure of state	per capita federal education aid	5.1
Pogue & Sgontz (1968)	48 states, 1958-1964	per capita total expenditure for local education	per capita federal education aid	-0.25 to 1.72
		per capita total expenditure for all levels of education	per capita federal education aid	3.0 to 4.9
Smith (1968)	50 states, 1965	per capita state-local expenditure from own funds	per capita federal education aid	0.69, statistically insignificant
Pidot (1969)	81 largest SMSAs in 1962	per capita SMSA total expenditure	per capita federal aid	0.13, statistically insignificant
Booms & Hu (1971)	50 states, 1960	per capita total state-local expenditure	per capita federal aid	1.68
O'Brien (1971)	48 states, 1958-1966	per capita state-local expenditure from own funds	per capita federal education aid	0.67

Table 5 : Empirical studies on the impact of federal grants on state and local educational expenditures, studies using data after 1966

Author (Date of Publication)	Data (Cross-sectional analysis unless stated otherwise)	Dependent Variable (Educational Expenditure, E)	Independent Variable (Grant, G)	Response (Marginal change, dE/dG unless stated otherwise)
Grubb & Michelson (1974)	159 school districts in Mass., 1968-1969	per pupil locally financed expenditure	per pupil federal Title 1 grant	4.4
			per pupil other federal education grant	-0.5
Ladd (1975)	78 communities in Mass., 1970	per pupil total expenditure	per pupil state and federal education aid	1.1
Feldstein (1978)	4690 school districts across country, 1970	per pupil total expenditure	per pupil federal Title 1 grant	0.72
			per pupil other federal education grant	0.41
Vincent & Adams (1978)	school districts in Colorado, 1973 & 1975	per pupil total expenditure	per pupil federal education aid	1.6 for 1973, 0.87 for 1975
		change in per pupil total expenditure between 1975 & 1973	change in per pupil federal education aid between 1975 & 1973	1.46

	school districts in Minnesota, 1972 & 1976	per pupil total expenditure	per pupil federal education aid	1.3 for 1972, 0.89 for 1976
		change in per pupil total expenditure between 1976 & 1972	change in per pupil federal education aid between 1976 & 1972	0.81
Adams (1979)	school districts in Maryland, 1972-1976 pooled data analysis	per pupil total expenditure	per pupil federal education categorical grant	1.05 to 1.18
	school districts in Wisconsin, 1973-1974 & 1975-1976	per pupil total expenditure	per pupil federal education categorical grant	0.65 for both periods
Park & Carroll (1979)	451 school districts in Michigan, 1971-1976	per pupil total expenditure	per pupil federal education categorical grant	0.38 (elasticity equals 0.02)
Craig & Inman (1982)	48 states, 1965-1977 pooled data analysis	state education aid to local educational authorities	federal pass-through education aid	0.32
			federal pass-by education aid	-1.55
			federal matching education aid	-1.37

Table 6 : Empirical studies related to general revenue sharing aid and federal unrestricted lump-sum aid to state and local governments.

Author (Date of Publication)	Data (Cross-sectional analysis unless stated otherwise)	Dependent Variable (General Public Expenditure, E)	Independent Variable (Grant, G)	Response (Marginal change, dE/dG unless stated otherwise)
Gramlich (1968)	state and local expenditures, 1954-1965	general public expenditure	unconditional block grants	0.28
Inman (1971)	41 major cities, 1966-1967	general public expenditure of city	unrestricted lump-sum aid from all sources	approach 1.0
Gramlich & Galper (1973)	10 urban governments 1962-1970	general public expenditure	increment in unconditional budgetary resources	0.25
	48 states, 1954-1972 time-series analysis	general public expenditure	increment in unconditional budgetary resources	0.43
Nathan et al (1975)	8 states & 56 localities 1972	general public expenditure	general revenue sharing aid	26 percent on new spending
Juster (1976)	149 counties & 668 municipalities	educational spending	general revenue sharing aid	3.8 to 6.1 percent of GRS aid
Nathan et al (1977)	8 states & 56 localities December 1972 to June 1974	general public expenditure	general revenue aid aid	24 percent of aid on new spending

Notes

1. Earlier reviews of the impact of intergovernmental grants on educational spending include Cohn (1974), and Vogel (1977, 1982). The Cohn review limits itself only to an analysis of state aid to local governments, while this paper discusses the impact of federal aid on the educational spending of state and local governments as well as the impact of state aid. The Vogel review presents a tabulation of the quantitative findings of some empirical studies without an analysis of their conceptual and statistical bases. The present paper addresses the specific features of each study and focuses on the conceptual and statistical problems underlying the empirical results.

2. The different types of intergovernmental grants include unrestricted block grants, matching grants, categorical grants, state aid to education, and general revenue sharing. For a discussion of the mechanics of these grants, see Levin (1982 : 23-35).

3. Other sub-categories usually include welfare, highway construction, and public safety. The second type of study considered in this review is represented by Sacks and Harris (1964), Campbell and Sacks (1967), Pidot (1969), Hu and Booms (1971), Osman (1966), Pogue and Sgontz (1968), O'Brien (1971), Struyk (1970), Weicher (1972), Gramlich and Galper (1973), and Smith (1968). There are many studies in the empirical literature on the impact of intergovernmental grants on total public expenditure as well as on several categories of non-educational public expenditures of

state-local governments. They are not discussed here since they do not relate directly to educational expenditures. For a review of these studies, see Gramlich (1977).

4. For a concise comparision of time-series and cross-sectional studies, see Gramlich (1969).

5. For a discussion of least-squares regression estimation, see Johnson (1972 : chapter 5). Most of the studies reviewed here have used total educational expenditure (per capita or per pupil) as the dependent variable. The studies by Smith (1968), Cohn (1974, Pennsylvania study), Stern (1973), and Grubb and Michelson (1974) have used locally-financed educational expenditure (per capita or per pupil) as the dependent variable. Total educational expenditure is equal to locally-financed educational expenditure plus intergovernmental aid. Bowman's study (1974) has used school tax (per pupil) as the dependent variable while the study by Craig and Inman (1982) is the only one reviewed here that has used state education aid as the dependent variable.

6 See, for example, the study by Booms and Hu (1971)

7. See, for example, the study by Black & Lewis & Link (1979)

8. See, for example, the study by Hu and Booms (1971).

9. For a discussion and an application of these two methods, see Adams (1980).

10. For more discussion on the various forms of state grants to education, see Cohn (1974), chapters 3 and 4. The price effect of a matching grant is as follows. Without intergovernmental aid, a local government bears the entire cost of education. Consider a

state matching grant which awards m dollars to a local government for each dollar of educational expenditure financed by the local government. In this case, the price (or cost) faced by the local government per dollar of educational expenditure is 1/(1+m). Thus the higher the matching rate m, the lower the price of educational services faced by the local government. In some of the empirical studies reviewed here, the price 1/(1+m) was used as one of the independent variables to determine the price effect of a matching grant.

11. See note 5.

12. Education is one of several functions of a city government, but it is the major function of a school district. Thus decisions of a school-district government regarding educational expenditures are likely to take place under an environment different from that of a city government. For this reason, studies on educational expenditures of school districts and cities are grouped separately.

13. In this review, "coefficient" refers to the marginal increase in educational expenditure in dollars per additional dollar of intergovenmental aid, unless stated otherwise.

14. Let "a" be the marginal change (in dollars) in total expenditure per additional dollar of an intergovernmental grant. From the definition of the terms dilutive, substitutive, and stimulative on page 5 and page 6, it can be seen that if "a" is negative, then the grant is dilutive. If "a" is between zero and one, the grant is both substitutive and stimulative (substitutive-stimulative). The grant is purely stimulative when "a" is greater than one.

15. For a discussion of OLS and TSLS estimators, see Johnson (1972).

16. For an econometric discussion of the principal components technique, see Johnson (1972 : 322-331).

17. Two thirds of these cities are located in western or mid-western states. Of the thirteen eastern cities included, eleven of them are in Pennsylvania. Of the twenty-nine southern cities considered, seventeen are in Texas. Thus not all sections of the country are equally represented in the sample.

18. In their study, Hu and Booms added state grants and federal grants together to form the total intergovernmental grants for the various categories of public services considered.

19. Feldstein (1975) pointed out that the value 0.6 might be biased upward because in 1970 most block grants were paid to towns that passed the limit of matching aid so that block grants were endogenous.

20. Since total educational expenditure is equal to locally-financed educational expenditure plus intergovernmental aid, it can be readily shown that the coefficient for the intergovernmental-aid variable of the regression using total educational expenditure as the dependent variable is equal to one plus the coefficient of the intergovernmental-aid variable of the regression using locally-financed educational expenditure as the dependent variable, ceteris paribus.

21. For a discussion of the issue of fiscal neutrality and school finance equalization which is the basis for power equalization, see Coons, Clune, and Sugarman (1970).

22. The authors used a utility function specification, a linear additive specification, a log-linear specification, and a linear expenditure function. For more details, see Grubb and Michelson (1974).

23. A study by Tresch (1974) also looks at the impact of federal education aid on the educational spending of state and local governments. But this study regresses the education share of total public spending on the education share of total aid. The regression coefficient is 3.49. The causal interpretation of the coefficient is unclear, and it is also obvious that it is not comparable to the other coefficients presented in Table 5.

24. To be exact, the response is $1.10 for each additional dollar of total intergovernmental categorical aid (state plus federal categorical aid).

25. Note that the unrestricted lump-sum aid includes fully used, closed-ended matching grants, block grants, and unconditional aid.

26. These studies include Juster (1976), Craig and Inman (1982), and an unpublished study by Shapiro.

27. Some studies have analyzed the impact on educational spending of both state block grants for education and state education categorical grants. See, for example, the studies by Vincent and Adams (1978), Park and Carroll (1979), and Adams (1980). These studies have found that the ratio of the standard error to the estimated effect of state education categorical grants was smaller than that of state block grants for education.

28. See, for example, the studies by Grubb and Michelson (1974), Feldstein (1978), Vincent and Adams (1978), and Craig and Inman (1982).

References

Adams, E. Kathleen. Analysis and Comparison of Fiscal Response in Four States, Denver Colorado : Education Finance Center, Education Commission of the States, December 1979.

Adams, E. Kathleen. Fiscal Response and School Finance Simulations : A Policy Perspective, Denver Colorado : Education Finance Center, Education Commission of the States, December 1980.

Barro, S. M. Theoretical Models of School District Expenditure Determination and the Impact of Grants-in-aid, Santa Monica, California: Rand Corporation, 1972.

Benson, Charles. The Economics of Public Education, Third Edition, Boston, Mass.: Houghton Mifflin, 1978.

Bishop, George A. "Stimulative versus Substitutive Effects of State School Aid in New England," National Tax Journal, Vol. 17(2), 1964, pp. 133-143.

Black, David E., Lewis, K. A., and Link, C. K. "Wealth Neutrality and the Demand for Education," National Tax Journal, Vol. 32(2), June 1979, pp. 157-164.

Booms, Bernard H., and Hu, T. W. "Towards a Positive Theory of State and Local Public Expenditures : An Empirical Example," Public Finance, Vol. 26, 1971, pp. 419-435.

Bowman, J. H. "Tax Exportability, Intergovernmental Aid, and School Finance Reform," National Tax Journal, Vol. 27(2), 1974, pp. 163-173.

Brazer, Harvey E. "City Expenditures and Local Government Structure," Occasional Paper No. 66, National Bureau of Economic Research, 1959.

Campbell, Allen, and Sacks, Seymour. Metropolitan America, Fiscal Patterns and Governmental Systems, Glencoe, New York: The Free Press, 1967.

Clyde, R. W. "Educational Expenditure Determination Study : A Supply and Demand Approach," unpublished Masters essay, Univeristy Park, Pa.: Department of Economics, Pennsylvania State University.

Cohn, Elchanan, Economics of State Aid to Education, Lexington, Mass.: Heath Lexington Books, 1974.

Coons, John E., Clune, William H., and Sugarman, Stephen D. Private Wealth and Public Education, Cambridge, Mass.: Belknap Press, 1970.

Craig, Steven G., and Inman, R. P. "Federal Aid and Public Education : An Empirical Look at the New Fiscal Federalism," processed, 1982.

Feldstein, Martin S. "Wealth Neutrality and Local Choice in Public Education," American Economic Review, Vol. 65(1), 1975, pp. 75-89.

Feldstein, Martin S. "The Effect of a Differential Add-on-grant, Title 1 and Local Education Spending," Journal of Human Resources, Vol. 13(4), 1978, pp. 443-458.

Gramlich, Edward M. "Alternative Federal Policies for Stimulating State and Local Expenditures : A Comparison of Their Effect," National Tax Journal, Vol. 21(2), June 1968, pp. 119-129.

Gramlich, Edward M. "The Effect of Federal Grants on State-local Expenditures : A Review of the Economic Literature," National Tax Association, Proceedings of the Sixty-second Annual Conference on Taxation, 1969, pp. 569-593.

Gramlich, Edward M., and Galper, Harvey. "State and Local Fiscal Behavior and Federal Grant Policy," Brookings Papers on Economic Activity, Vol. 1, 1973, pp. 15-65.

Gramlich, Edward M. "Intergovernmental Grants : A Review of the Empirical Literature," in Wallace Oates (ed.), The Political Economy of Fiscal Federalism, Lexington, Mass.: Lexington Books, 1977.

Grubb, W. Norton, and Michelson, S. States and Schools, Lexington, Mass.: Heath Lexington Books, 1974.

Grubb, W. Norton, and Osman, Jack. "The Causes of School Finance Inequalities : Serrano and the Case of California," Public Finance Quarterly, Vol. 5(3), July 1977, pp. 373-392.

Hu, T. W., and Booms, Bernard H. "A Simultaneous Equation Model of Public Expenditure Decisions in Large Cities," Annals of Regional Science, Vol. 5 December 1971, pp. 73-85.

Inman, Robert. "Towards an Econometric Model of Local Budgeting," National Tax Association Papers and Proceedings, 1971, pp. 699-719.

Johnson, J. Econometric Methods, New York : McGraw-Hill Book Company, 1972, Second Edition.

Juster, F. Thomas (ed.). The Economic and Political Impact of General Revenue Sharing, National Science Foundation, Research Applied to National Needs, Washington, D. C., April 1976.

Ladd, Helen F. "Local Education Expenditures, Fiscal Capacity, and the Composition of the Property Tax Base," National Tax Journal, Vol. 28(2), June 1975, pp. 145-158.

Levin, Henry M. "Rethinking the Role of Federal Grants in National Educational Policy," Institute for Research on Educational Finance and Governance, Stanford University, forthcoming 1982.

McMahon, Walter W. "An Economic Analysis of Major Determinants of Expenditures on Public Education," Review of Economics and Statistics, Vol. 52, August 1970, pp. 242-252.

Miner, Jerry. Social and Economic Factors in Spending for Public Education, Syracuse : Syracuse University Press, 1963.

Nathan, Richard P., et al. Monitering Revenue Sharing, The Brookings Institution, Washington D. C., 1975.

Nathan, Richard P., et al. Revenue Sharing : The Second Round, The Brookings Institution, Washington, D. C., 1977.

O'Brien, Thomas. "Grants-in-aid : Some Further Answers," National Tax Journal, Vol. 24(1), 1971, pp. 65-77.

Osman, Jack W. "The Dual Impact of Federal Aid on State and Local Government Expenditures," National Tax Journal, Vol. 19(4), 1966, pp. 362-372.

Park, R. E., and Carroll, S. J. The Search for Equity in School Finance: Michigan School District Response to A Guaranteed Tax Base, Santa Monica, California: Rand Corporation, R-2393-NIE/HEW, March 1979.

Pidot, George B. "A Principal Components Analysis of the Determinants of Local Government Fiscal Patterns," Review of Economics and Statistics, Vol. 51, 1969, pp. 176-188.

Pogue, T. F., and Sgontz, L. G. "The Effect of Grants-in-aid on State-local Expenditure," National Tax Journal, Vol. 21(2), 1968, pp. 190-199.

Reischauer, R. D. "Governmental Diversity : Bane of the Grants Strategy in the United States," in Wallace Oates (ed.) The Political Economy of Fiscal Federalism, Lexington, Mass.: Lexington Books, 1977.

Renshaw, Edward F. "A Note on the Expenditure Effect of State Aid to Education," Journal of Political Economy, Vol. 68, April 1960, pp. 170-174.

Sacks, Seymour, and Harris, Robert. "The Determinants of State and Local Government Expenditures and Intergovernmental Flows of Funds," National Tax Journal, Vol. 17(1), 1964, pp. 75-85.

Sacks, S., and Ranney, David. "Suburban Education : A Fiscal Analysis," Urban Affairs Quarterly, Vol. 2(1), September 1966, pp. 103-119.

Sacks, S., Ranney, David, and Andrew, Ralph. City Schools/Suburban Schools, Syracuse : Syracuse University Press, 1972.

Shapiro, Robert. "Federal Grants and City Expenditures," unpublished paper, Stanford University.

Smith, David. "The Response of State and Local Governments to Federal Grants," National Tax Journal, Vol. 21(3), 1968, pp. 349-357.

Stern, David. "Effects of Alternative State Aid Formulas on the Distribution of Public School Expenditures in Massachusetts," Review of Economics and Statistics, Vol. 55, February 1973, pp. 91-97.

Struyk, Raymond. "Effects of State Grants-in-aid on Local Provision of Education and Welfare Services in New Jersey," Journal of Regional Science, Vol. 10(2), 1970, pp. 225-235.

Tresch, Richard. "Estimating State Expenditure Functions : An Empirical Test of the Time Series Informational Content of Cross Sectional Estimates," Public Finance Vol. 29(3-4), 1974, pp. 370-385.

United States Department of Commerce, Bureau of Census, Historical Statistics on Governmental Finance and Employment, 1977 Census of Governments, Washington, D. C., Vol. 6(4), 1980.

Vincent, Phillip E., and Adams, E. K. Fiscal Response of School Districts : A Study of Two States - Colorado and Minnesota, Denver, Colorado : Education Finance Center, Education Commission of the States, October 1978.

Vogel, Mary. Education Grant Consolidation : Its Potential Fiscal and Distributive Impacts, Santa Monica, California: The Rand Corporation, WN-10059-HEW, December 1977. Also published in Harvard Eductional Review, Vol. 52(2), May 1982, pp. 169-188.

Weicher, John C. "Aid, Expenditures, and Local Government Structure," National Tax Journal, Vol. 25(4), 1972, pp. 573-583.

Wendling, Wayne. "The Cost of Education Index : Measurement of Price Differences of Education Personnel Among New York State School Districts," Working paper no. 26, Denver Colorado : Education Finance Center, Education Commission of the States, April 1980.